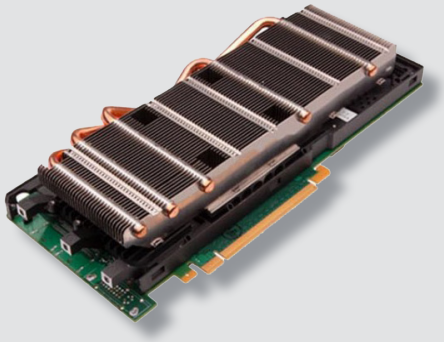
Earth System Research Laboratory (ESRL)
Global Systems Division (GSD)

Putting tools in the hands of users

Gaming Technology Speeding up Science



The GPU Tesla gaming card by NVIDIA; innovative technology to power our science. Development is underway in NOAA's Earth System Research Laboratory to explore these powerful processors for research.

Example of a high-resolution weather model-called the FIM that runs faster and uses less power on a GPU. Graphic by Evan Polster.

NOAA supercomputer. It takes up more space and power than the proposed GPUs, and is more expensive and less reliable. Photo by Will von Dauster.

Next Generation of High-Performance Computing

Within two years, it will take over 200,000 Computer-Processing Units (CPUs) to run very high-resolution regional and global weather models to provide accurate and timely weather and climate forecasts. NOAA researchers are exploring cutting-edge, high-performance computer architectures to handle these enormous demands. The key to solving this dilemma lies in affordable, powerful processors called graphics-processing units or GPUs, designed for life-like video games.

Why Explore GPUs?

- Reliability: Accurate weather forecasting depends on reliability. By their sheer size, large CPU systems are considerably more complex and sensitive to individual component failures than GPUs.
- Economics: GPUs are 10–20 times cheaper than CPUs for equivalent performance. They also consume less power and space.
- Efficiency: GPU microprocessors execute work in small batches using memory more effectively so computations are never waiting in line.
- Speed: ESRL has demonstrated that a weather model can run 20–30 times faster on GPUs than on a traditional supercomputer.
- Limitations: NOAA's current supercomputer architecture will be unable to operate next-generation environmental models under development.

Revolutionary Advancement Requires Relentless Research

ESRL has made exciting progress since beginning to integrate GPUs for their advanced computing, and now NOAA looks to ESRL for continuing this revolutionary research. Many uncertainties still remain and a lot of work lies ahead. GSD perseveres with creative solutions.

Our goal is to provide technology that meets the needs of NOAA environmental modeling programs such as the Hurricane Forecast Improvement Program, Warn-on-Forecast, and the the National Weather Service Next-Generation Aviation Weather Program.

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